

Psoriatic Arthritis in a Fifth-Century Judean Desert Monastery

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ABSTRACT Psoriatic arthritis is a greatly underreported seronegative erosive arthropathy, due to the ambiguous lesions it leaves on bone in all but the most severe cases. For a confident diagnosis of psoriatic arthritis to be made, sacroiliac and intervertebral joint fusion must be present together with erosive lesions of the peripheral skeleton including most especially the terminal interphalangeal joints. In modern times it is only a small percentage of cases who experience such debilitating disease, which may explain why so few cases of psoriatic arthritis can confidently be identified from past populations.

This report describes this pathological condition as observed in the comin-gled skeletal remains of nine males and one female from the tomb of Paulus in the Byzantine Monastery of Martyrius, in the Judean Desert. Visual study was complemented using radiographic techniques along with scanning electron microscopy. Two adult males show characteristic lesions of psoriatic arthritis, demonstrating the form known as *arthritis mutilans*. A third individual shows less widespread erosive lesions which may signify a pauciarticular example of psoriatic arthritis, as is true of most cases in modern times, or the remains may represent Reiter's disease.

During the Byzantine period the earlier practise of expelling those with disfiguring diseases (biblical leprosy) evolved into a philanthropic, caring philosophy where the sick were housed and fed out of charity, often within monasteries. The presence of these cases of psoriatic arthritis within such a Judean Desert monastery confirms earlier suggestions that psoriasis was one of the diseases included by those in the ancient eastern Mediterranean under the umbrella term of biblical leprosy. © 1996 Wiley-Liss, Inc.

Rescue excavations carried out by the Israel Antiquities Authority in 1983 uncovered the monastery of Martyrius, 2.5 acres in size, which lay 10 km east of present-day Jerusalem. This large monastery was built in the fifth century AD and destroyed during the Persian invasion of 614 AD, never to be rebuilt (Magen, 1990). Beneath the mosaic floor of one of the chapels was a common mass grave, discovered in situ, dedicated to an important historical figure in the monastic order named Paulus and bearing the Greek inscription "Tomb of Paulus, priest and archimandrite." While no exact date is

given on the tombstone, epigraphic and literary evidence suggests that the tombstone is from the late fifth or early sixth century (Di Segni, 1990). Presumably this was the date of his internment. In the ensuing years an additional eight males and one female were interred in the chamber, which measured 210 × 70cm.

There are three goals to this study. First,

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we will show that psoriatic arthritis was present in the ancient Middle East by describing the lesions noted among the comingled bones from the tomb of Paulus. Second, we hope through this report to greatly increase awareness of the criteria which must be satisfied before a case of seronegative arthritis can be diagnosed in dry bone. Some standard paleopathology texts are sadly far too brief and often inaccurate with regard to psoriatic arthritis. Third, we will discuss the implications of finding these remains in a fifth-century Byzantine monastery in the Judean Desert, located on the pilgrim route between Jerusalem and the River Jordan, where many sick would bathe in the hope of a cure.

While age-dependent degenerative changes are frequently found in our surveys of the Byzantine monasteries of the Judean Desert due to the often advanced age of the inhabitants at death, erosive arthropathies other than those associated with leprosy have been noticeably absent from the osteoarcheological record of the ancient Holy Land (Zias, 1986), as well as more generally from the Mediterranean area. To date, the earliest reported finding of psoriatic arthritis in antiquity in the Old World is likewise from a sixth-century site in North Africa (Kilgore and Jurmain, 1989). Cases of seronegative arthropathy from ancient Judea have been described (Bloom and Smith, 1992) but insufficient lesions were present to differentiate further among this group of diseases. A likely case of psoriatic arthritis has also been described from medieval England (Dieppe and Rogers, 1989). The reported evidence of the disease in the New World ca. 3,000–5,000 BP (Rothschild, 1988) has been questioned by paleopathologists (Rogers, 1990) on the basis of the morphological criteria used in diagnosing pathology in dry bone specimens.

Psoriasis is a common, genetically associated inflammatory and proliferative disease of the skin, the most characteristic lesions consisting of chronic, sharply demarcated dull-red scaly plaques (Camp, 1992). The association of these skin lesions with inflammatory polyarthritis is generally credited to Baron Jean Louis Alibert (1768–1837) in his work of 1818, under the heading *Lepre*

Squammeuse. The proportion of those with psoriasis who also develop inflammatory polyarthritis varies with the severity and form of skin lesions but is thought to be less than 10% in modern populations (Camp, 1992). The resulting arthritis may be one of a number of overlapping loose categories. Most psoriatic arthritis (60–70%) consists of asymmetric involvement of fingers and toes. About 5% have mild chronic distal interphalangeal joint disease associated with nail pitting. Around 5% exhibit fusion of sacroiliac and intervertebral joints with or without peripheral joint disease. Another 5% demonstrate *arthritis mutilans*, a destructive polyarthritis of the small bones of the hands and feet with gross deformity and joint subluxation. Other lesions associated with psoriatic arthritis include enthesopathies, plantar spurs and joint fusion (Bennet, 1989). The “cup and pencil” changes to the phalanges may also be seen, where distal phalangeal shafts have been remodelled to give a whittled appearance while the corresponding articular surface with which this would normally articulate may become unusually concave. The prevalence of psoriatic arthritis is approximately equal between the sexes, unlike some erosive arthropathies such as rheumatoid arthritis (3:1 female preponderance) and the sexually acquired form of Reiter’s disease, which is almost entirely confined to males.

MATERIALS AND METHODS

The skeletal remains recovered from the tomb of Paulus represent nine adult males and one adult female. Unfortunately the bones were not articulated but comingled, suggestive of secondary interment. This comingling of the remains along with the erosive pathology placed certain anatomical constraints on our analysis in that it was impossible to fully associate the remains, particularly those of the extremities, with a particular skeleton. In consequence, age estimation for each of these adults was thought too unreliable a procedure using standard anthropological techniques (Bass, 1987). The comingling of the remains together with the severity of the destructive lesions in the group was responsible for a

TABLE 1. *Differential diagnosis of psoriatic arthritis in skeletal remains*

	Psoriatic arthr	Reiter's disease	Ankyl spond	Entero arthr	Rheum arthr	Erosive osteo	Leprosy
Ankylosis of sacroiliac joint	yes; asymmetric	yes; asymmetric	yes; symmetric	yes; either	no	no	no
Vertebral fusion	yes; skip lesions	yes; skip lesions	yes; continuous	yes; either	no	no	no
Distal IP joints affected	yes; erosive	yes; erosive	no	yes; non erosive	no	yes; erosive	yes
MTP and IP joints affected	yes; erosive	yes; erosive	no	yes; non erosive	yes; erosive	yes; erosive	no
Enthesopathies	yes	yes	yes	no	yes	yes	no
Plantar spurs	yes	yes	yes	no	no	yes	no
Joint fusion	yes	yes	yes	no	yes	yes	yes
Phalangeal pencil and cup deformity	yes	no	no	no	yes; "opera-glass" deformity	no	no
Number of joints	poly	mono/pauci	axial	pauci	poly	peripheral skeleton	peripheral/face
Associated skin lesion	severe	moderate	none	mild	mild	none	severe

Arthr = arthritis; ankyl spond = ankylosing spondylitis; entero = enteropathic; rheum = rheumatoid; osteo = osteoarthritis; mono = monoarticular; pauci = pauciarticular; poly = polyarticular.

preliminary misdiagnosis of leprosy by one of the authors (Zias, 1985) rather than of a seronegative arthropathy. The remains were in good condition in general but larger bones such as the pelvis were often fragmentary. Due to pressure from religious circles for reburial and the threat of looting, the remains were removed quickly. Stratigraphic evidence clearly showed that the tomb was in situ, having lain untouched for 13 centuries.

The skeletal material was studied first by macroscopic observation which was then followed by more detailed analysis of key areas of interest. Many of the erosive and proliferative lesions were subjected to radiographic imaging and erosive lesions of the phalanges were studied using scanning electron microscopy (SEM).

DIFFERENTIAL DIAGNOSIS OF PSORIATIC ARTHRITIS

While psoriatic arthritis was not differentiated from many similar conditions by the Byzantines, it is important that physical anthropologists in modern times are aware of those diseases which leave similar lesions on dry bone (Rogers et al., 1985). A brief outline of the nature and skeletal distribution of lesions found in conditions which might be confused with psoriatic arthritis will help to clarify the differential diagnosis area (Table 1).

Reiter's disease

Sometimes termed reactive arthritis, Reiter's disease may follow sexually acquired urethritis or gastrointestinal infections. Skeletal involvement can include ankylosis of the sacroiliac joints, syndesmophyte formation in the spine, erosive lesions of the joints of the hands and feet, enthesopathies of tendon insertions, bony spurs on the plantar aspect of the feet and joint fusion. Despite the widespread location of known lesions, typically only one to five joints are affected and involvement of the hands is very rare compared with the feet (Ford, 1989).

Ankylosing spondylitis

The characteristic lesions are symmetrical fusion of the sacroiliac joints and ascending syndesmophyte formation in the thoracolumbar area to produce the "bamboo spine." Joints of the limbs may also be affected, with enthesopathies, plantar spurs and joint fusion all noted as possible lesions. However, the fingers and toes are never involved (Ball, 1989).

Enteropathic arthritis

This condition follows inflammatory bowel disease and involvement of the axial and peripheral skeleton has been observed. Ankylosis of the sacroiliac joints and consecutive vertebrae may be coupled with pauciarticular

lar arthritis, typically in the lower limb, but lesions are not erosive. Enthesopathies, plantar spurs and joint fusion are not characteristic of this condition (Aldo-Benson, 1989).

Rheumatoid arthritis

Rheumatoid arthritis is an erosive polyarthritis affecting articular surfaces of joints in the axial and peripheral skeleton. Enthesopathies and joint fusion are also known to occur. However, the distal interphalangeal joints of the hands and feet remain unaffected, there is no ankylosis of joints in the axial skeleton and plantar spurs are not to be expected (Hough and Sokoloff, 1989).

Erosive osteoarthritis

This rare erosive form of the common degenerative arthritis involves primarily the interphalangeal joints of the hands and feet. Erosive lesions of joints sometimes progress to bony ankylosis, while spurring and enthesopathies are also seen. The axial skeleton and long bones of the limbs remain unaffected (Moskovitz, 1989).

Acne-associated spondylarthropathy

Spondylarthropathy secondary to the skin condition *acne vulgaris* may demonstrate both axial and peripheral involvement. In Europe male adolescents are typically involved while in people of African descent older males are more typically involved. The form noted in Europeans is entirely limited to soft tissues and causes no changes to bone, while in Africans bone may become involved. Axial skeletal involvement includes asymmetric paravertebral ossification of upper vertebrae and uni- or bilateral sacroiliac fusion. Peripherally, asymmetric erosive lesions and subluxation of any joints of the hands and feet may occur, including the distal interphalangeal joints, as well as the limbs (Ellis, 1987). In consequence, some suggest this form of arthropathy in African cases to be indistinguishable from certain cases of psoriatic arthritis or Reiter's disease.

ANALYSIS OF THE SKELETAL REMAINS

The minimum number of adult individuals affected with a seronegative arthritis is

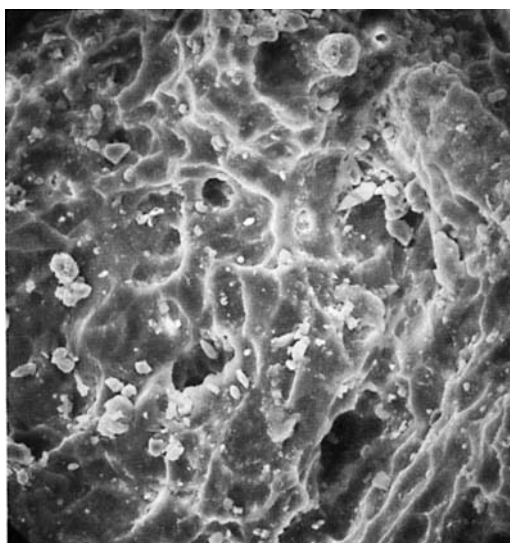


Fig. 1. Scanning electron micrograph of erosive lesion showing osteoclastic activity (magnified $\times 1000$).

three, which was determined by the presence of classical pathology on three left fifth metatarsal bones.

The characteristic lesion seen throughout the skeletal material is an erosive cavitation with variable degrees of sclerosis, exhibiting a spectrum from shallow erosion into the cortex to severe erosion into cancellous bone. These erosive lesions (Fig. 1) are periarticular in some areas, but in others have destroyed the joint to the extent of producing localised areas of intact articular surface encircled with cavitation which completely separates this surface from other similar areas. Other typical lesions seen include erosive enthesopathies at tendon insertions, ossification of ligaments and tendons to produce spurs and ankylosis of joints.

The distribution of these lesions is crucial if accurate determination of the causative disease process is to be allowed. Details of the numbers of bones involved at various areas of the skeleton are summarised in Table 2.

Peripheral skeleton

The hands demonstrate lesions in the phalanges, metacarpals and carpal bones. Proximal phalanges exhibiting pathology show a

TABLE 2. *Summary of lesions in the skeletal material*

	Erosion at joints	Fusion of joints	Enthesopathy	Spurring
Sacroiliac joints	no	1 left 1 right	no	no
Intervertebral joints	no	4 segments	no	no
Distal IP Joints				
hand	1	no	no	no
feet	5	no	no	no
Remaining bones				
hand	29	no	no	no
feet	44	no	3	3
Wrist	2 right 1 left	no	no	no
Elbow	2 right 1 left	1 right	2 right 1 left	no
Shoulder	2 right 2 left	no	no	no
Sternoclavicular	2 right 2 left	no	no	no
Ankle	1 right 2 left	no	1 right 1 left	no
Knee	2 right 2 left	no	2 right 2 left	no
Hip	no	no	no	no

spectrum from mild, poorly defined, shallow, periarticular erosion to advanced, well defined, deeply cavitating erosion into the cancellous bone of the epiphyses, in some areas with destruction of the articular surfaces. Such changes are seen at both the proximal interphalangeal joints and the metacarpophalangeal joints. There is also shallow, fully sclerosed erosion of the superior and inferior surfaces of the distal halves of the phalangeal shafts, known as whittling (Fig. 2). Excess concavity of the articular surfaces of the proximal end of phalanges is also present in some examples. While only a limited number of middle and distal phalanges from the hands were available for study, typical lesions at the distal end of the proximal phalanx of the first digit (thumb) show that involvement of this distal interphalangeal joint did occur. The metacarpal and carpal bones similarly exhibit this spectrum of erosive lesions, with examples from proximal and distal joint surfaces.

The feet show comparable erosive lesions to those found in the hands. Examples are seen in the interphalangeal joint surface of the distal phalanges (Fig. 3), including four examples of the first digit (hallux), and at the proximal and distal ends of a number of middle and proximal phalanges, metatarsals (Fig. 4) and tarsal bones. Pedal lesions

include those found in three left fifth metatarsals. Erosive talar lesions with variable levels of sclerosis are located around the margins of the trochlear and malleolar surfaces of the body. Three calcanei show involvement, including gross pitting with moderate sclerosis on the superior surface anterior to the posterior talar articular surface, in the area of the attachment of the inferior extensor retinaculum. There are also examples of erosive cavitation of the posterior surface of the calcaneum, deep to the site of the bursa. Inferior to this area, ossification of the insertion of the tendo calcaneus is also visible, to form bony spurs.

Several examples of radial (Fig. 5), ulnar and humeral erosive involvement at both proximal and distal joint surfaces as well as tendon insertions further confirm involvement of the wrists, elbow and shoulder. One right humeroulna joint is fused (Fig. 6) with boney ankylosis, in a slightly flexed position (approximately 140 degrees). In the lower limb there are typical lytic lesions at the ankle and knee joints with further examples of tendon enthesopathy.

Axial skeleton

There are four examples of fused consecutive vertebrae. One represents the second to seventh cervical vertebrae which have un-

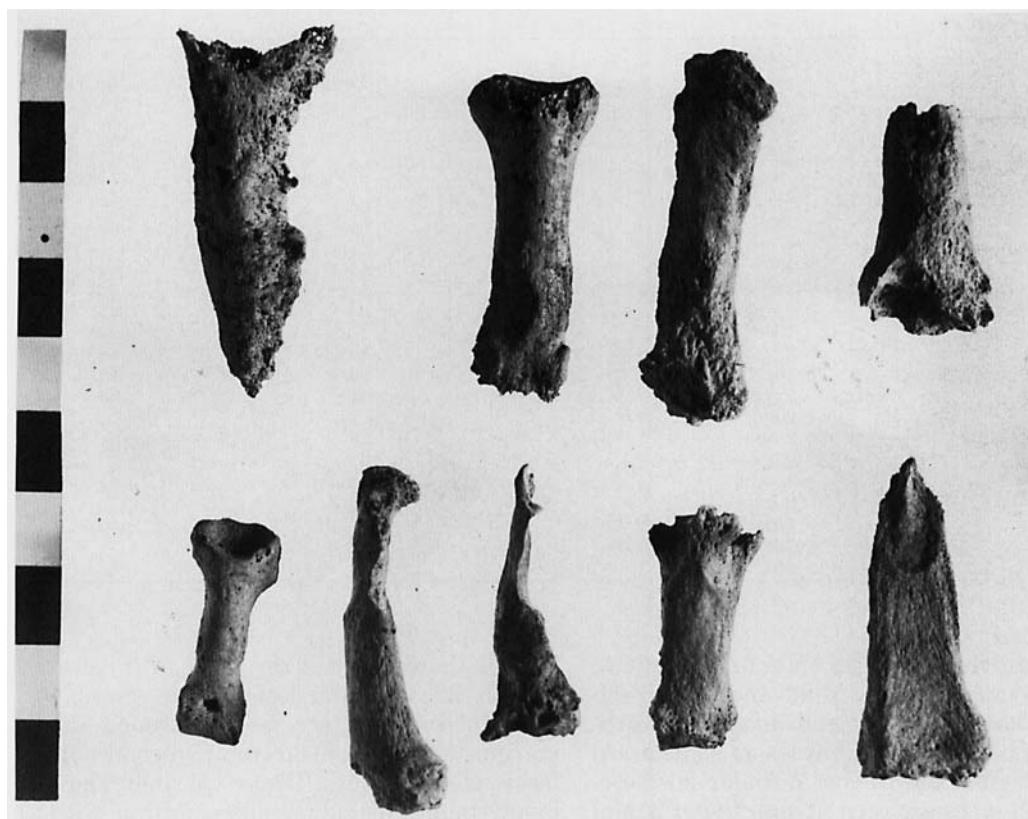


Fig. 2. Phalanges demonstrating whittling, cupping and erosive lesions.

dergone bony ankylosis, with the concurrent fusion of the atlas to the occipital condyles of the skull base (Figs. 7 and 8). Incomplete fusion of the anterior surface of the bodies of the second to third and fourth to fifth vertebrae show the syndesmophyte to have arisen from the anterior, lateral and posterior surfaces of the bodies, rather than from the body margins, which suggests calcification of the longitudinal ligaments. The vertebral arches also demonstrate bony fusion. There is moderate scoliosis with the concavity to the right in these ankylosed vertebrae. From another individual there are fused first to third cervical vertebrae, again with surface syndesmophyte. The remaining example of ankylosis is comprised of two upper thoracic vertebrae fused by their vertebral arches but not the bodies.

In the pelvis one left sacroiliac joint shows complete bony fusion (Fig. 9), while a right

sacroiliac joint from a separate pelvis is undergoing ankylosis, so that the joint is fixed but incompletely fused.

There are also erosive lesions of the shoulder, acromioclavicular and sternoclavicular joints, with enthesopathies of the costoclavicular ligament.

COMPARISON WITH EXPECTATIONS

The comingled context of these remains makes it necessary to ask whether all the lesions were in fact caused by the same condition in each individual. One fact both researchers strongly agreed upon was that the lesions throughout the material appeared to have the same cause. There was no evidence that two differing underlying disease processes were present. It is thought that one individual suffered with a more severe case of the condition than the others, as often



Fig. 3. Distal phalanges of the first digit of foot, four showing erosive lesions at the interphalangeal joint, with one normal bone for comparison.



Fig. 4. Radiograph of metatarsals and metacarpals illustrating erosive cavitation, bony spurring and articular damage.

when several joints were noted to demonstrate pathology the most prolific lesions would be found in a right and left example with similar degree of involvement. Having determined that a similar etiology lay behind the lesions noted, comparison with the

diseases in our differential diagnosis will allow us to determine this underlying disease state.

Aspects of the pathology seen are compatible with a number of diseases. Erosive cavitating lesions may be found in seronegative

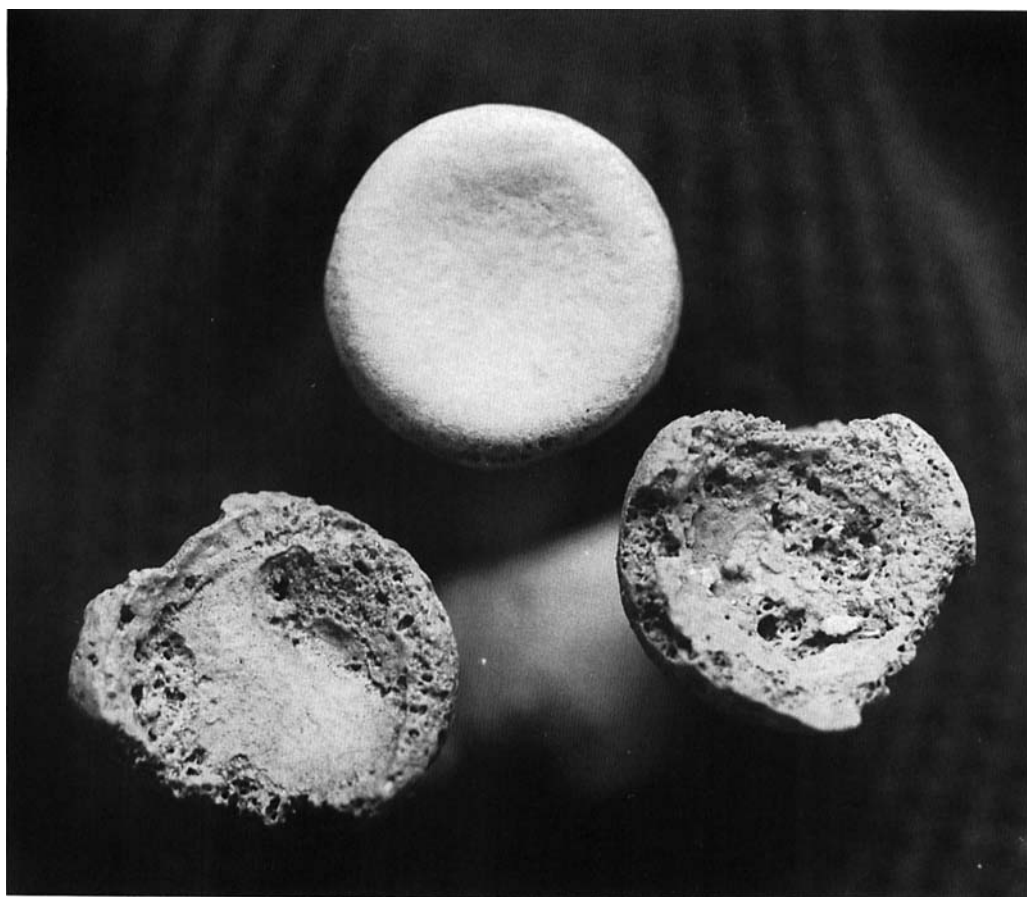


Fig. 5. Erosive lesions at distal end of the radius, with a normal bone for comparison.



Fig. 6. Ankylosed right humeroulnar joint, posterolateral view.

arthropathies such as psoriatic arthritis (Bennet, 1989) and Reiter's disease (Ford, 1989), together with rheumatoid arthritis (Hough and Sokoloff, 1989) and erosive osteoarthritis (Moskovitz, 1989). The destruction and whittling of the digits may be reminiscent of leprosy (Ortner and Putschar, 1985). Ankylosis of the sacroiliac joint may be seen in psoriatic arthritis, Reiter's disease, ankylosing spondylitis and enteropathic arthritis, as may vertebral fusion (Rogers et al., 1987). Enthesopathies are compatible with rheumatoid arthritis and seronegative, arthropathies, and the latter may be associated with bone spurs.

While the spectrum of lesions in many conditions overlaps in some respects, in these cases most can be ruled out. Leprosy is not

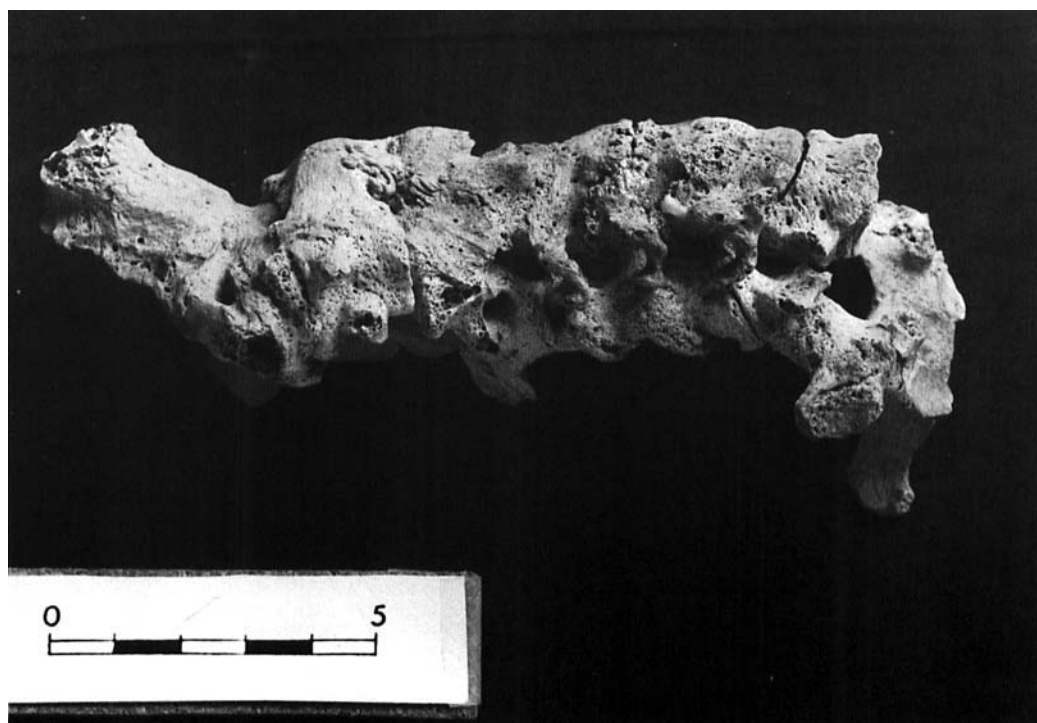


Fig. 7. Ankylosed cervical vertebrae.

characteristically associated with vertebral fusion, sacroiliac ankylosis, enthesopathies or spurs (Ortner and Putschar, 1985), so can be excluded. Adult rheumatoid arthritis does not cause ankylosis of the sacroiliac joint and, while it may affect the cervical vertebrae, it tends to cause dislocation rather than boney fusion. Nor does rheumatoid arthritis affect the distal interphalangeal joints (Hough and Sokoloff, 1989), where lesions were noted in this material. Erosive osteoarthritis affects the digits in a manner reminiscent of the condition seen here, but does not affect the axial skeleton (Moskovitz, 1989), so is incompatible as a diagnosis. Acne-associated spondylarthropathy may cause lesions very similar to those seen here, but typically in Africans, rather than Europeans. Structural characteristics such as the shape of the nose and face of these individuals preclude an African origin, so this type of arthritis may be removed from our differential diagnosis. Enteropathic arthritis may lead to axial skeletal joint fusion but not

erosive lesions of the digits and so is another condition that may be excluded.

The sacroiliac joint ankylosis is strongly suggestive of a seronegative arthropathy. Psoriatic arthritis, Reiter's disease and ankylosing spondylitis may all cause fusion at the sacroiliac joints, as well as of consecutive vertebrae, and are associated with enthesopathies and spurs (Rogers et al., 1987). However, ankylosing spondylitis tends to involve the lower vertebrae and does not affect the phalanges of the hands and feet (Ball, 1989), so is incompatible with the lesions seen. Reiter's disease may demonstrate many of the lesions seen in psoriatic arthritis and if fewer bones from the hand had been recovered, differentiation between these two would be extremely difficult. However, Reiter's disease tends to manifest itself as a mono- or pauciarticular arthritis and panarthritis is extremely rare (Murray, 1990). Furthermore, Reiter's only rarely involves the hands and wrists, and both these facts are in stark contrast to the material under study. These



Fig. 8. Lateral radiograph of ankylosed cervical vertebrae.

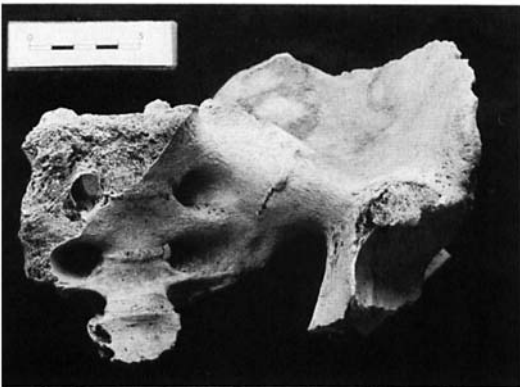


Fig. 9. Fused left sacroiliac joint.

two factors preclude Reiter's disease as the principal diagnosis for the three individuals.

The severity of the pathological condition and the widespread distribution of the lesions enable a diagnosis of seronegative ar-

thritis for all three individuals. It is only the classical examples which display the maximum amount of pathology which can be confidently diagnosed in diseases of this kind. Many cases of inflammatory arthritis can at best be tentatively and non-specifically ascribed to a certain diagnosis "according to the most probable cause" (Rogers et al., 1987). For example, most people with psoriatic arthritis develop an asymmetric pauci-arthritis of the hands and feet and this manifestation cannot be differentiated from several other similar conditions. Fortunately, the lesions noted in the material under study include all that is necessary for a firm diagnosis. In the axial skeleton there are two examples of ankylosis of the sacroiliac joint, which is often unilateral, together with vertebral fusion with skip lesions. Peripherally there is upper and lower limb involvement, enthesopathies and spurs, intraarticular ankylosis, and erosive lesions in and around joints including the terminal interphalangeal joints. There were even good examples of the "cup and pencil" deformity. As a result, a retrospective diagnosis of psoriatic arthritis for at least two of these individuals seems the most appropriate, and they appear to have suffered with the form known as *arthritis mutilans*.

While there are a large number of examples where two identical joints demonstrate classical lesions, we know that three individuals suffered disease with similar underlying cause as three examples of the left fifth metatarsal were recovered, each with extremely similar erosive lesions. One possibility is that this third individual did still have psoriasis and only manifested itself as pauci-articular arthritis, which is the case in 60–70% of psoriasis sufferers today. Another alternative is that this person had Reiter's disease, which has very similar lesions. Reiter's often has concurrent skin involvement, such as *keratoderma blenorrhagicum*, and it is easy to understand how it could appear indistinguishable from psoriasis to the Byzantines. In summary, we conclude that two individuals had the *arthritis mutilans* form of psoriatic arthritis, while a third either suffered with a pauciarticular form of psoriatic arthritis, or had Reiter's disease.

DISCUSSION

The confusion regarding a correct diagnosis for dermatological conditions in the ancient world has been well documented by many Moslem, Christian and Jewish scholars. All agree that the *lepra* (Latin) or *tsar'at* (Hebrew) of the Old Testament has no clinical relationship with leprosy today, but there is less agreement over the precise meaning of the term in antiquity (Lendrum, 1952; Manchester, 1984). From the description in Leviticus chapters 13 and 14 it is clear that at that time the term was a generic nonscientific word covering a wide variety of dermatological conditions which were prevalent in the eastern Mediterranean prior to the second century BC, and excluded true leprosy. There is agreement among scholars that psoriasis was one of the more common dermatological conditions to be regarded as biblical leprosy in the centuries prior to the common era. Unfortunately, particularly for the sufferers of psoriasis, this semantic confusion between true leprosy and psoriasis lasted well into the 19th century (Feldman, 1966). For the lay person the confusion between true leprosy and psoriatic arthritis is readily apparent in its clinical appearance, though etiologically they are completely different. The coupling between bilateral joint deformity in the extremities and dermatological involvement occurs in both diseases and this would have led to confusion between the two. Moreover, from an Old Testament theological perspective, differentiation between the two conditions is of no consequence as either disease made it imperative that the individual must reside alone, outside the confines of the town (Leviticus, 13:46).

Although for centuries those individuals diagnosed as suffering from biblical leprosy were ostracised (Dzierzykray-Rogalski, 1980; Andersen, 1969), a theological change occurred during the Byzantine period (fourth to seventh centuries CE) with the early Christian community now regarding sufferers as being chosen by God to suffer in this world for the world to come (Hefelee, 1909). As a result of this theological shift from ostracism to concern, special facilities were now built for their care, including sev-

eral in the Holy Land (Usener, 1980; Avi-Yonah, 1963; Zias, 1986). Surveys carried out in these monasteries during the 1980s corroborated the literary evidence for the existence of these facilities for biblical leprosy (Zias, 1986). The concentration of these people in the monasteries is further confirmed by the presence of these three individuals in one site. By the fifth century CE it is thought that conditions regarded as leprosy in the biblical sense included Hansen's disease, psoriasis and a variable number of other skin diseases, especially if associated with a musculoskeletal component. If less than 10% of those with psoriasis develop arthritis and only 5% of those with psoriatic arthritis develop *arthritis mutilans*, the presence of the cases described here implies a considerable number of cases of psoriasis in these monasteries, undiagnosable using current paleopathological techniques.

CONCLUSION

While the association of psoriasis with arthritis was recognised by the medical establishment in the 19th century, the findings reported here suggest that the disease existed in the Old World in antiquity despite the paucity of reported evidence. The fact that the ancient written record clearly recognised psoriasis as a distinct medical entity seems obvious, but psoriasis in and of itself would not leave any osteoarcheological evidence. As up to 10% of those with psoriasis also develop some type of inflammatory joint disease it becomes clear as to how psoriasis and leprosy may have been mistakenly regarded as one condition, or at least as variants of the same debilitating disease. While skin sensation and rhinomaxillary involvement clearly delineates the two diseases, the effects on the limbs must have presented diagnostic problems in the past. Even today, according to Cochrane (1964) and Jopling (1986), two of the worlds most respected leprologists, diagnosing leprosy is difficult for the trained dermatologist who is unfamiliar with the bewildering variety of cutaneous manifestations of the disease. Because of these diagnostic difficulties, the number of diseases that has been mistakenly diagnosed under the umbrella term of leprosy in

early times is legion (Cochrane, 1964). The human skeletal remains interred in the tomb of Paulus reported here appear to reflect this confusion between Hansen's disease and a number of similar dermatological conditions including psoriasis.

LITERATURE CITED

- Aldo-Benson MA (1989) Enteropathic arthritis. In DJ McCarty (ed.): *Arthritis and Allied Conditions*. 11th ed. Philadelphia: Lea and Febiger, pp. 972-979.
- Alibert JL (1818) *Precis Theorique et Pratique sur les Maladies de la Peau*. Vol. 2. Paris: Caille et Ravier, p. 21.
- Andersen J (1969) Studies in the medieval diagnosis of leprosy in Denmark: An archeological, historical and clinical study. *Dan Med Bull* 16, Supplement 9.
- Avi-Yonah M (1963) The bath of the lepers at Scythopolis. *Israel Exploration Journal* 13:325-326.
- Ball GV (1989) Ankylosing spondylitis. In DJ McCarty (ed.): *Arthritis and Allied Conditions*. 11th ed. Philadelphia: Lea and Febiger, pp. 934-943.
- Bass WM (1987) *Human Osteology: A Laboratory and Field Manual*. Columbia, Missouri: Missouri Archaeological Society.
- Bennet RM (1989) Psoriatic arthritis. In DJ McCarty (ed.): *Arthritis and Allied Conditions*. 11th ed. Philadelphia: Lea and Febiger, pp. 954-971.
- Bloom RA and Smith P (1992) On the antiquity of the seronegative spondylarthropathies: Evidence from ancient Judea. *Skeletal Radiol* 21:111-114.
- Camp RDR (1992) Psoriasis. In RH Champion, JL Burton, and FJG Ebling (eds.): *Textbook of Dermatology*. Vol 2, 5th ed. Oxford: Blackwell, pp. 1391-1457.
- Cochrane R (1964) *Leprosy in Theory and Practice*. Bristol: Wright.
- Di Segni L (1990) The monastery of Martyrius at Ma'ale Adummim: The inscriptions. In: *Christian Archaeology in the Holy Land. New Discoveries*. Jerusalem: Franciscan Printing Press, pp 153-163.
- Dieppe P and Rogers JM (1989) Skeletal paleopathology of rheumatic disorders. In DJ McCarty (ed.): *Arthritis and Allied Conditions*. 11th ed. Philadelphia: Lea and Febiger, pp. 8-15.
- Dzierzykray-Rogalski (1980) Paleopathology of the Ptolemaic inhabitants of the Dakleh Oasis (Egypt). *J Hum Evol* 9:71-74.
- Ellis BI, Shier CK, Leison JJC, Kaston DJ, and McGoeys JW (1987) Acne-associated spondylarthropathy: Radiographic features. *Radiology* 165:541-545.
- Feldman Y (1966) Dermatology in the Bible. *Cutis* 2:984-988.
- Ford DK (1989) Reiter's syndrome: Reactive arthritis. In DJ McCarty (ed.): *Arthritis and Allied Conditions*. 11th ed. Philadelphia: Lea and Febiger, pp. 944-953.
- Hefele C (1909) *Histoire des Concils*. Vol. 3. Paris: Librairie Letouzey et Ane.
- Hoade E (1981) *Guide to the Holy Land*. 11th edition. Jerusalem: Franciscan Printing Press.
- Hough AJ and Sokoloff L (1989) Pathology of rheumatoid arthritis and allied disorders. In DJ McCarty (ed.): *Arthritis and Allied Conditions*. 11th ed. Philadelphia: Lea and Febiger, pp. 674-697.
- Jopling W (1986) *Handbook of Leprosy*. London: Heinemann.
- Kilgore L and Jurmain R (1989) Possible Psoriatic Arthritis in a Skeleton from Carthage, Tunisia. Paper presented at the sixteenth annual meeting of the Paleopathology Association in San Diego, California.
- Lendrum F (1952) The name leprosy. *Am J Trop Med Hyg* 1:999-1008.
- Magen Y (1990) The monastery of St. Martyrius at Ma'aleh Adummin and its mosaics. In: *Christian Archaeology in the Holy Land: New Discoveries*. Jerusalem: Franciscan Printing Press. pp. 91-152.
- Manchester K (1984) Tuberculosis and leprosy in antiquity: An interpretation. *Med Hist* 28:162-173.
- Moskovitz RW (1989) Clinical and laboratory findings in osteoarthritis. In DJ McCarty (ed.): *Arthritis and Allied Conditions*. 11th ed. Philadelphia: Lea and Febiger, pp. 1620-1621.
- Murray RO, Jacobson HG, and Stoker DJ (eds.) (1990) *The Radiology of Skeletal Disorders*. Vol 1, 3rd ed. Edinburgh: Churchill Livingstone.
- Ortner D and Putschar W (1985) *Identification of Pathological Conditions in Human Skeletal Remains*. Washington, D.C.: Smithsonian Institution Press.
- Rogers J (1981) Arthritis in saxon and medieval skeletons. *Br. Med. J.* 283:1668-1671.
- Rogers J (1990) Reflections on a conference on the antiquity of the erosive arthropathies. *Paleopathology Newsletter* 69:15-16.
- Rogers J, Watt I, and Dieppe P (1985) Paleopathology of spinal osteophytosis, vertebral ankylosis and vertebral hyperostosis. *Ann Rheum Dis* 44:113-120.
- Rogers J, Waldron T, Dieppe P, and Watt I (1987) Arthropathies in paleopathology: The basis of classification according to the most probable cause. *Journal of Archeological Science* 14:179-193.
- Rothschild BM (1988) Symmetrical erosive peripheral polyarthritis in the Late Archaic Period of Alabama. *Science* 242:1498-1501.
- Usener H (1890) *Vita S. Theodosii a Cyrillo Scythopolitano Scripta*. Bonn: Typiss C. George Univ. Typogr.
- Zias J (1985) Leprosy in the Byzantine monasteries of the Judean desert. *Koroth* 9 (1-2).
- Zias J (1986) Was Byzantine Herodium a leprosarium? *Biblical Archeologist* September pp. 182-186.